



CHARGE



Attitudes to 'Smart' Public Chargepoints

End User Survey

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1 Background

The mass adoption of electric vehicles (EVs) is imperative if the UK is to reach its 2050 emission commitments and net zero aspirations. Yet, for many drivers, the transition to EVs will be unrealistic without greater access to public charging infrastructure, with approximately 40% of UK homes unsuited for private off-road charging.

As such, UK distribution network operators (DNOs) are looking at a wide range of solutions to enable greater deployment of public chargepoints. These include substantial plans for targeted network reinforcement, the procurement of flexibility services, and the provision of flexible connections dedicated to public charging infrastructure.

Although network reinforcement provides the most enduring solution for the deployment of public chargepoints, it is often prohibitively expensive and / or requires an extended lead time. It is therefore essential that DNOs can provide customers with alternative connection options as either a permanent or temporary solution in lieu of reinforcement.

1.1 Overview of the Charge Project

The purpose of the Charge Project is to accelerate the deployment of public chargepoints for electric vehicles. It aims to do this by providing stakeholders with access to information about where there will be a growing demand for public charging infrastructure and where there is available network capacity. In combination, this information will enable optimal investment locations to be identified.

The Charge Project is developing 'ConnectMore', an industry-leading self-service connection tool that will reduce the time it takes for customers to get a quote for the connection of public chargepoints to the network. ConnectMore empowers customers to choose their own connections, giving them access to combined public charging infrastructure demand and network capacity maps to identify suitable locations. Customers can then select their own connection at a point on the network with available capacity – ConnectMore will automatically generate a corresponding connection cost estimate.

In addition, a key focus of the Charge Project is to provide greater access to network capacity through the introduction of Smart Charging Connections (SCCs). These flexible connections will allow customers to maximise the amount of chargepoints or total rating they can add to new or existing network infrastructure, whilst minimising the delay, cost and disruption of new connections. The option to choose an SCC instead of a conventional connection requiring reinforcement is also built into ConnectMore.

Further information on ConnectMore and Smart Charging Connections can be found on the Charge Project website: www.chargeproject.co.uk.

1.2 Acceptability of Smart Charging Connections

Technical challenges and the low level of market readiness, combined and accentuated by the impact and uncertainty caused by the COVID pandemic, has meant that the real-world SCC trials that were originally planned have been replaced with alternative evidence gathering exercises:

- Engagement with local government, chargepoint operators and installers, along with wider interested parties. This has resulted in valuable insights into the acceptability of Smart



Charging Connections. The findings have been detailed in the Public Chargepoint Flexibility Insight Report¹.

- Virtual trials that demonstrate SCC operation using a physical distributed energy resources management system infrastructure alongside simulated network and EV chargepoint behaviours.
- Desktop studies to simulate SCC implementation to a larger range of network cases and study scenarios.
- An end user survey to obtain feedback on EV driver attitudes towards the acceptability of Smart Charging Connections. This report describes the approach adopted and summarises the findings from the end-user survey.

2 Methodology

The survey was focused on obtaining electric vehicle drivers' views on the introduction of Smart Charging Connections. A very high-level description of the potential advantage of Smart Charging Connections and the likely impact on end users was provided as follows:

- they have the potential to increase the number of public chargepoints in the short term without the need for costly upgrades to the electricity network; and
- the likely impact on the user is that the vehicle will take longer to reach full charge if a constraint (a reduction in the charging rate) is in force.

Participants were restricted to existing drivers of battery electric vehicles (those that have a battery powered electric motor only and must be plugged in to charge) and those drivers considering the switch to a battery electric vehicle (BEV) as it was considered that the views would be more objective than those from non-EV drivers.

The survey was structured in three parts:

- EV ownership, driving and charging behaviours. The survey starts by asking participants some preliminary questions about the type of vehicle they drive, access to parking where they live, how often and where they usually charge their vehicle. Respondents who were not existing BEV drivers and had no plans to purchase or lease a battery electric vehicle were screened out of the survey at this point.
- Views on 'smart' public chargepoints. This section gathers information on how likely participants are to use a smart public chargepoint in different locations, what information they would like to see displayed at the chargepoint / on chargepoint apps and how they would like to be informed that the charging rate had been reduced whilst charging their vehicle. At the end of this section, participants were asked to provide any views they have on the advantages and / or disadvantages of introducing smart chargepoints in public locations and, if they have reservations, what will make smart chargepoints more acceptable to them as a charging option.
- Demographics. In the final part of the survey, participants were asked some questions about their gender, age, and geographic location. All of these questions included the option 'Prefer not to say'.

A copy of the end user survey is provided in Appendix I.

¹ Public Chargepoint Flexibility Insight Report, December 2021: [Chargepoint Flexibility Insight Report Final.pdf \(spenergynetworks.co.uk\)](#)



The survey was hosted through Microsoft Forms, issued via social media and promoted at dissemination events to try to reach a wide range of existing and potential drivers of battery electric vehicles. Email addresses and other contact details were not collected to ensure anonymity.

3 Profile of Respondents

121 people responded to the survey. 85 respondents already drive a battery electric vehicle and 31 are considering the purchase or lease of a BEV. The remaining 5 indicated that they have no plans to buy or lease a battery electric vehicle. As the survey was targeted specifically towards the drivers of battery electric vehicles and those drivers who are considering the switch to an electric vehicle, these were screened out of the survey after question 2.

The findings from 116 drivers of battery electric vehicles and those considering the switch to a BEV are presented in this report. Three quarters of the responses are from drivers who already have a BEV and one quarter of respondents indicated that they are considering the purchase or lease of a battery electric vehicle.

3.1 Country of Residence

The majority of the 116 respondents were from England, as indicated in Figure 1. For existing drivers of battery electric vehicles, a higher proportion are from Scotland and Wales compared with those considering the switch to a BEV.

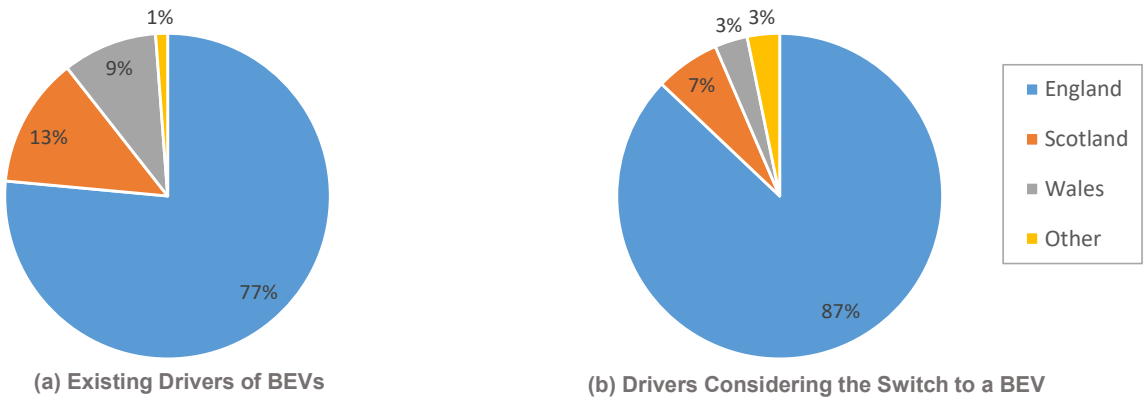


Figure 1 Profile of Respondents by Country

3.2 Area

Participants were also asked to identify the area they normally live in, the options being urban, suburban or rural. The breakdown is shown in Figure 2 by country and area, with most respondents living in suburban areas followed by urban areas in England and Scotland. Overall, 49% of respondents describe themselves as living in suburban areas, 25% in urban areas and 26% in rural locations.

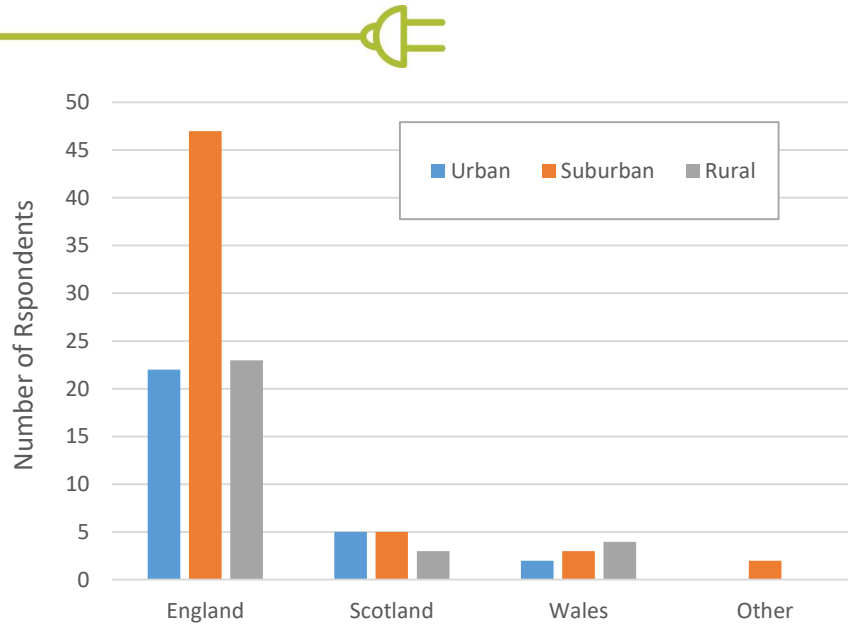


Figure 2 Profile of Respondents by Country and Area

44% of those respondents who already drive a BEV describe themselves as living in suburban areas, 29% in rural locations and the remaining 27% in urban areas. Of those participants that do not currently drive a battery electric vehicle but are considering the switch, 65% describe themselves as living in suburban areas, 19% in urban areas and 16% in rural locations.

3.3 Age and Gender Identification

The age profile of existing BEV drivers and those considering the switch is shown in Figure 3. The largest age demographic was the 45-54 age group, accounting for 28% of survey responses with a further 27% in the 55-65 age group. Just 2% of the respondents were under 25 and 13% were over 65 years of age.

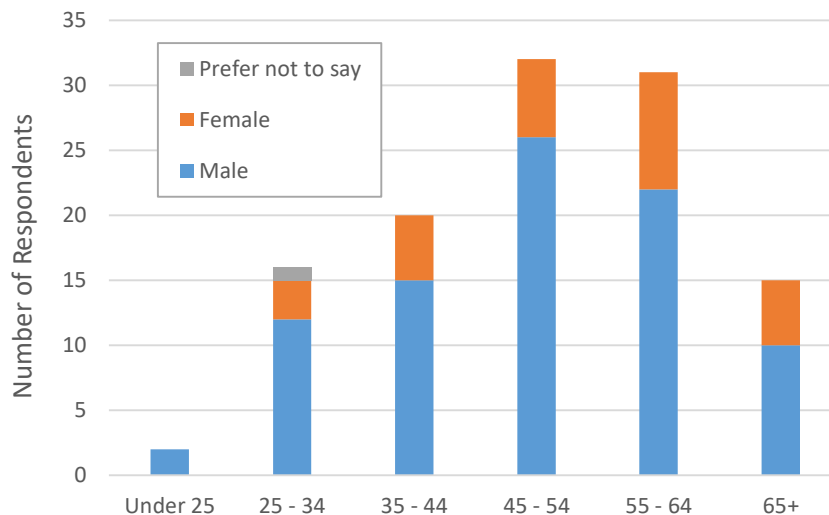


Figure 3 Breakdown of Respondents by Age and Gender Identification

Most respondents (75%) indicated that they identified as male, with 24% indicating they identified as female. 1% preferred not to disclose their gender identity. The age demographic of respondents identifying as female is generally higher, with 50% aged over 55 compared with 36% of those identifying as male.



The age profile and gender identification of those respondents who already drive a BEV is broadly similar to that for all respondents. Of those participants that do not currently drive a battery electric vehicle but are considering the switch, 52% are under 45 years of age, compared with 26% of existing BEV drivers.

4 EV Ownership, Driving and Charging Behaviours

Of the 116 responses from existing BEV drivers and those considering the switch, 73% are drivers of battery electric vehicles (BEVs), 4% drive plug-in hybrid electric vehicles (PHEVs) and 23% currently drive neither a BEV nor a PHEV (see Figure 4). All of the drivers of PHEVs indicated that they are planning to switch to a battery electric vehicle in the future.

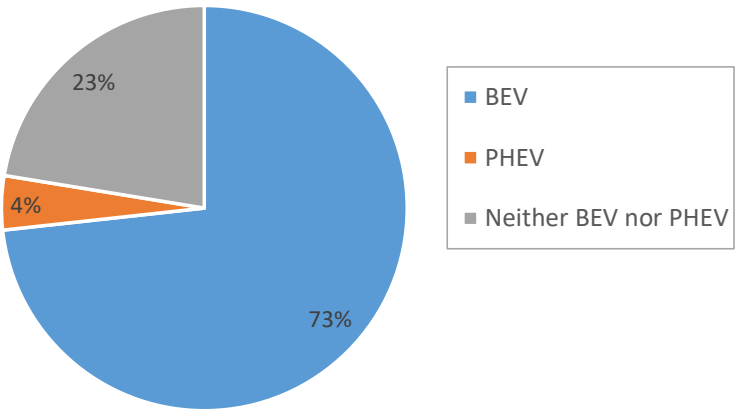


Figure 4 Profile of Respondents by Vehicle Type

Non-BEV drivers were asked whether they were planning to purchase or lease a battery electric vehicle. 28% of respondents reported that they have plans to purchase or lease a BEV within the next 12 months, with 58% considering the switch at some point in the future.

Five respondents had no plans to buy or lease a battery electric vehicle. As the survey was targeted specifically towards the drivers of battery electric vehicles and those drivers who are considering the switch to an electric vehicle, these respondents were screened out of the survey after this question.

4.1 Length of Time Driving a BEV

Respondents were asked how long they had been driving a battery electric vehicle and a breakdown is shown in Figure 5. 13% of respondents have been driving a BEV for more than 5 years, whilst 22% of respondents have been driving a BEV for less than six months.

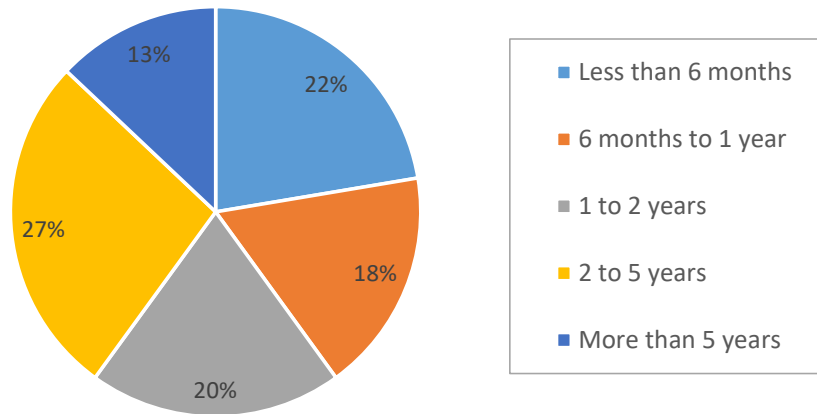


Figure 5 Length of Time Respondents have been Driving a BEV

4.2 Other Vehicles in Household

69% of respondents with battery electric vehicles indicated that their BEV was their primary vehicle, 22% said it was their only vehicle and the remaining 8% indicated that it was their secondary vehicle.

The breakdown of the classification of the vehicle within the household and the length of time respondents have been driving their BEV is shown in Figure 6. Of those respondents whose primary vehicle is a battery electric vehicle, 36% have been driving a BEV for more than 2 years and 22% for less than 6 months. Of those respondents whose only vehicle is a BEV, more than 50% have been driving similar vehicles for more than 2 years and 26% for less than 6 months.

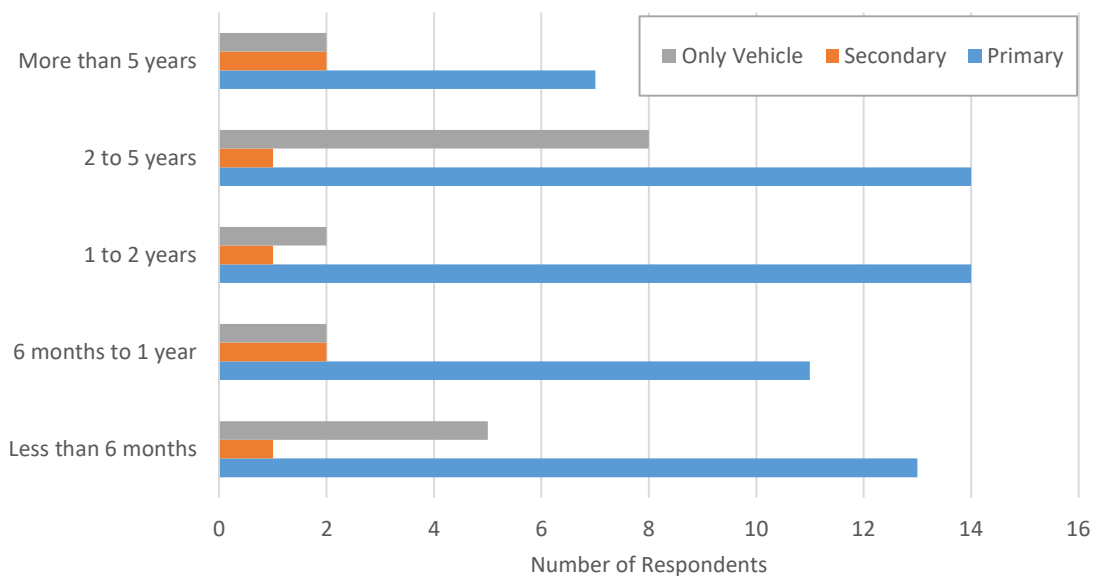


Figure 6 Breakdown of Vehicle Classification & Time Respondents have been Driving a BEV



4.3 Driving Behaviours

Drivers were asked how often they drove their BEV and a breakdown of the responses is shown in Figure 7. 40% of respondents reported that they used their vehicle on a daily basis with a further 35% using their BEV five to six times a week.

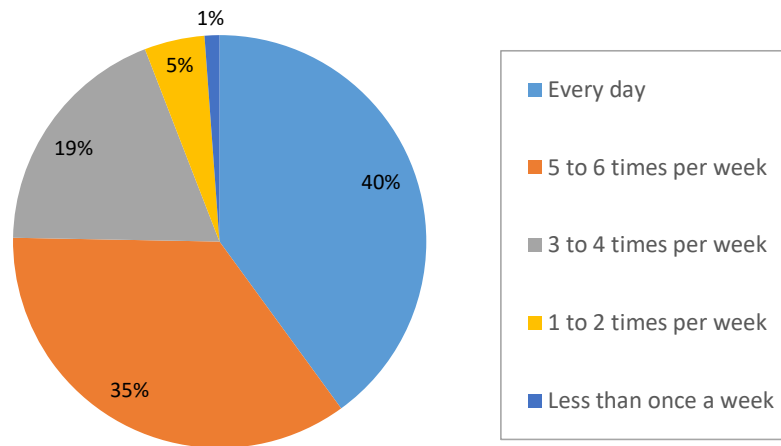


Figure 7 Breakdown of Frequency of BEV Journeys

Respondents were also asked how frequently they made journeys in their BEV that exceeded the range of their vehicle (see Figure 8). 42% of respondents indicated that they make such journeys several times a year, with 7% stating that they make journeys that exceed the range of their BEV once or more every week. 23% of respondents make journeys in their BEV that exceed the range of their vehicle once a year or less.

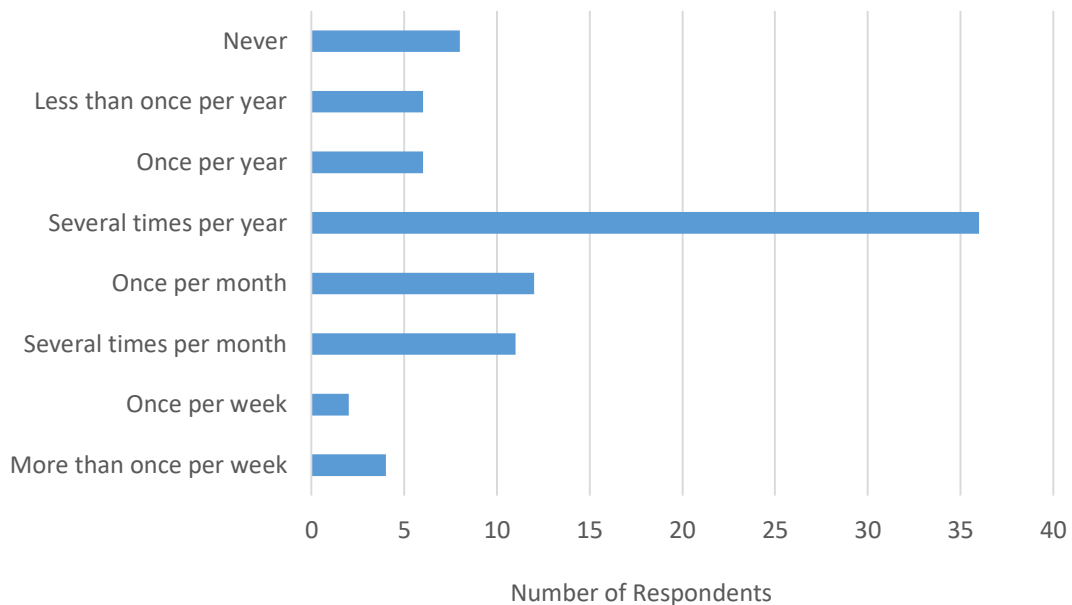


Figure 8 Frequency of Respondents Journeys Exceeding the Range of their BEV



4.4 Charging Behaviours

Most respondents that drive battery electric vehicles have access to off-street parking (80%) and have a dedicated chargepoint for their vehicle as can be seen in Figure 9. 14% of respondents have no access to a chargepoint at home and charge their vehicles at their workplace and / or public chargepoints; these BEV drivers describe themselves as living in urban or suburban areas.

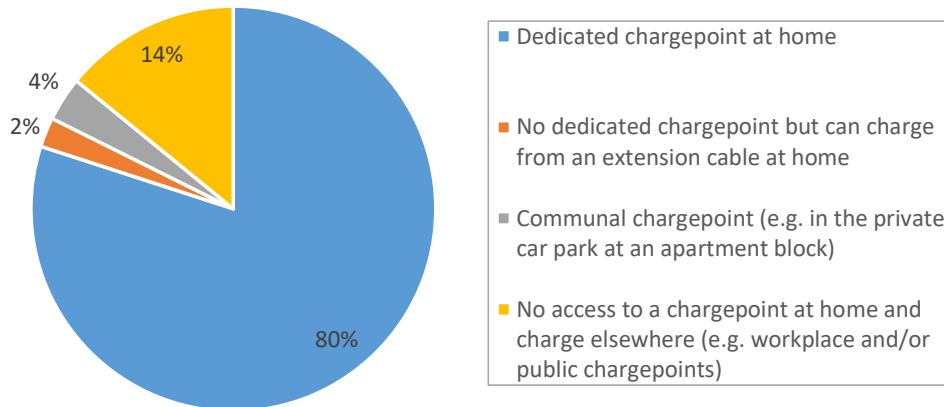


Figure 9 Access to EV Chargepoint at Home

Of the respondents that have access to charging at home, the majority (64%) carry out most of their charging at home as indicated in Figure 10. 28% reported that they perform most of their charging at home but sometimes use public chargepoints and 3% indicated that they used an even split of home and public charging.

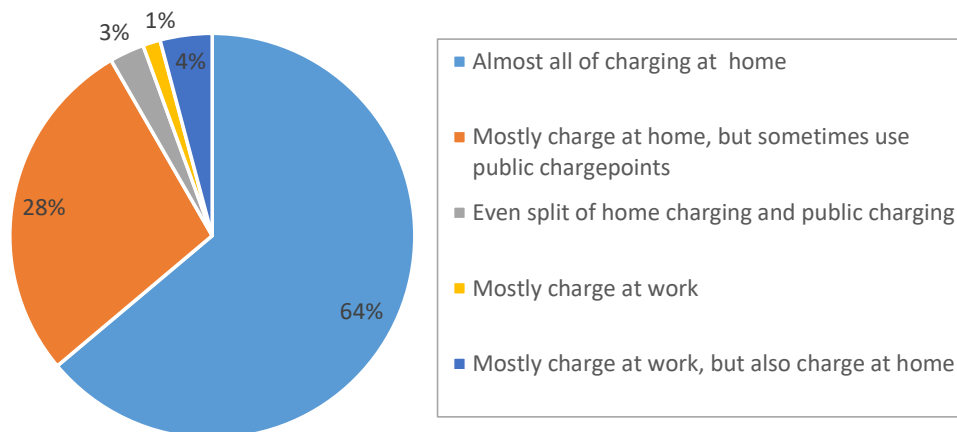


Figure 10 Charging Behaviours of BEV Drivers with Access to Home Charging

14% of respondents who drive a battery electric vehicle do not have access to a chargepoint at home (see Figure 9). Of these BEV drivers, 82% do all of their charging using public chargepoints and the remainder use an even split of workplace charging and public charging.



5 Views on 'Smart' Public Chargepoints

All respondents who currently drive a battery electric vehicle or are considering the switch to a BEV were asked how likely they would be to use a smart chargepoint in different locations:

- short-term destination (0–2 hours) such as shopping excursion (city centre carpark, supermarket, out-of-town retail park);
- medium-term destination (2–4 hours) such as leisure/tourist attraction;
- overnight destination (e.g. hotel);
- en route location (e.g. motorway service station);
- residential on-street; and
- workplace.

A summary of the responses is presented in Figure 11 where 'positive' (highly likely or likely if a conventional chargepoint is not available) responses are to the right of zero and 'negative' (unlikely or only if conventional chargepoint is not available) are to the left of zero.²

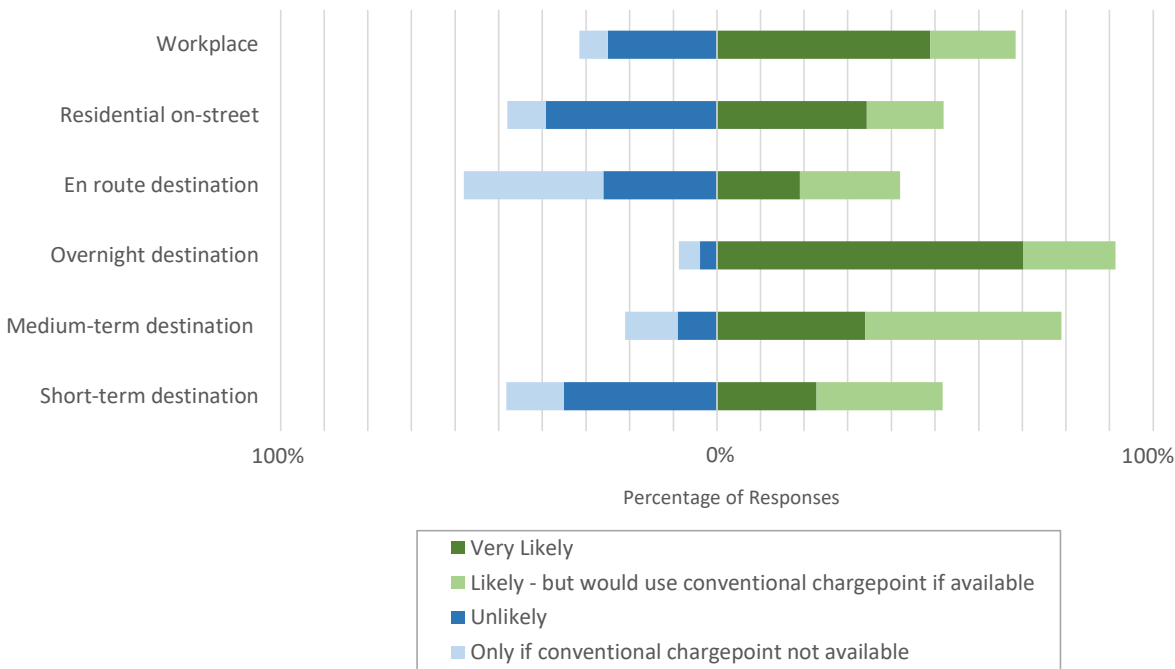


Figure 11 Likelihood of Respondents Using Smart Public Chargepoints in Different Locations

5.1 Short-Term Destination

Examples of short-term destinations include shopping excursions typically taking up to 2 hours with the vehicle parked in a city centre carpark, supermarket carpark or at an out-of-town retail park.

20% of responses from existing drivers of battery electric vehicles reported that they would be very likely to use a smart chargepoint at short-term destinations. Of these drivers, just over one third do

² Not all survey participants responded to each of the smart public chargepoint scenarios. The findings have been collated as a percentage of the number of responses for each scenario.



not have a dedicated chargepoint at home and 47% reported that they already use public chargepoints on occasion.

31% of responses from existing drivers of battery electric vehicle indicated that they would be likely to use a smart chargepoint at short term destinations but they would use a conventional chargepoint if one was available. Most of these drivers reported that their BEV is the primary or only vehicle in the household and have a dedicated chargepoint for their vehicle.

Most of the responses (37%) from existing drivers of battery electric vehicles indicated that they would be unlikely to use a smart chargepoint at short term destinations. The majority of these drivers have a dedicated chargepoint at home and are over 45 years of age.

The remaining 11% of responses from existing drivers of battery electric vehicles indicated that they would only use a smart chargepoint at short term destinations if a conventional chargepoint was not available. Most of these have a dedicated chargepoint for their vehicle and around two thirds of existing BEV drivers reported that they use public chargepoints on occasion.

Of those responses from participants who do not currently drive a battery electric vehicle but are considering the switch, 29% indicated that they would be very likely to use a smart chargepoint at short term destinations; these respondents live in suburban or rural areas and most are under 45 years of age. A further 29% of responses from those who are considering the purchase or lease of a BEV stated that they would be unlikely to use a smart chargepoint at a short-term destination. Of the remaining responses, 23% stated that they would be likely to use a smart chargepoint at a short-term destination but would use a conventional chargepoint if available and 19% indicated that they would only use one if a conventional chargepoint was not available.

5.2 Medium-Term Destination

Examples of medium-term destinations include leisure and tourist attractions where the vehicle is typically parked for 2 to 4 hours whilst visiting the facility. Respondents were more receptive to using smart chargepoints at medium-term destinations with 32% of existing BEV drivers stating that they would be very likely to use one.

42% of responses from existing drivers of battery electric vehicles indicated that they would be likely to use a smart chargepoint at medium-term destinations but they would use a conventional chargepoint if available. Most of these are using their BEVs more than five times a week and have a dedicated chargepoint for their vehicle at home.

12% of responses from existing BEV drivers reported that they would be unlikely to use a smart chargepoint at medium term destinations. All of these drivers have a dedicated charge point for their vehicle and carry out almost all of their charging at home.

The remaining 14% of responses from existing drivers of battery electric vehicles indicated that they would only use a smart chargepoint at medium term destinations if a conventional chargepoint was not available. All of these drivers are using their BEVs at least five times a week and the majority have a dedicated chargepoint for their vehicle at home.

Of those responses from participants who do not currently drive a battery electric vehicle but are considering the switch, 92% indicated that they would be very likely to use a smart chargepoint at medium term destinations or would use one if a conventional chargepoint was not available; just over 50% of these respondents are under 35 years of ages and live in suburban areas in England. The remaining responses (8%) from participants who are considering the purchase or lease of a



BEV indicated that they would only use a smart chargepoint at medium term destinations if a conventional chargepoint was not available.

5.3 Overnight Destination

A typical overnight destination is a hotel where the vehicle is parked overnight whilst staying at the hotel. Respondents were most receptive to this scenario with two thirds of existing BEV drivers stating that they would be very likely to use a smart chargepoint at an overnight destination.

22% of responses from existing drivers of battery electric vehicles indicated that they would be likely to use a smart chargepoint at an overnight destination but they would use a conventional chargepoint if one was available. The majority of these BEV drivers are using their vehicles more than five times a week and typically make trips that exceed the range of their vehicle several times a year.

5% of responses from existing BEV drivers reported that they would be unlikely to use a smart chargepoint at an overnight destination. All of these drivers have a dedicated charge point for their vehicle and most of them are rarely make trips that exceed the range of their vehicle. These respondents also indicated that they are unlikely to use a smart chargepoint at any location other than the workplace.

The remaining 6% of responses from existing drivers of battery electric vehicles indicated that they would only use a smart chargepoint at an overnight destination if a conventional chargepoint was not available. All of these drivers reported that their BEV is the primary or only vehicle in the household and most typically make trips that exceed the range of their vehicle several times a year.

Of those responses from participants who do not currently drive a battery electric vehicle but are considering the switch, 81% reported that they would be very likely to use a smart chargepoint at an overnight destination; two thirds of these respondents are under 35 years of age. The remaining responses stated that would be likely to use a smart chargepoint at an overnight destination but they would use a conventional chargepoint if available; most of these respondents are over 45 years of age.

5.4 En Route Location

Respondents were not very receptive to using smart chargepoints at an en route location such as a motorway service station. Only 21% of responses from existing BEV drivers stated that they would be very likely to use a smart chargepoint at an en route location. Most of these drivers are older than 55 and live in rural areas.

18% of responses from existing drivers of battery electric vehicles indicated that they would be likely to use a smart chargepoint at an en route location but they would use a conventional chargepoint if one was available. The majority of these drivers are using their BEVs more than five times a week and typically make trips that exceed the range of their vehicle several times a year.

27% of responses from existing BEV drivers reported that they would be unlikely to use a smart chargepoint at an en route location. The majority of these drivers are using their vehicles more than five times a week and typically make trips that exceed the range of their vehicle several times a month or more.

The remaining 34% of responses from existing drivers of battery electric vehicles indicated that they would only use a smart chargepoint at an at an en route location if a conventional chargepoint



was not available. Most of these drivers are using their vehicles more than five times a week and typically make trips that exceed the range of their vehicle several times a year.

Of those responses from participants that do not currently drive a battery electric vehicle but are considering the switch, 48% stated that they would be unlikely to use a smart chargepoint at an en route location or would only use one if a conventional chargepoint was not available. 15% of respondents who are considering the purchase or lease of a BEV indicated that they would be very likely to use a smart chargepoint at an en route location and the remaining 37% would use a smart chargepoint at an en route location if a conventional chargepoint was not available.

5.5 Residential On-Street

Two thirds of responses from existing BEV drivers with no access to a chargepoint at home stated that they would be very likely to use a residential on-street smart chargepoint. This compares with 28% of all existing BEV drivers indicating that they would be very likely to use a residential on-street smart chargepoint.

19% of responses from existing BEV drivers indicated that they would be likely to use a residential on-street smart chargepoint but they would use a conventional chargepoint if available. The majority of these are existing BEV drivers that have a dedicated chargepoint and live in suburban areas.

Most of the responses (43%) from existing drivers of battery electric vehicles reported that they would be unlikely to use a residential on-street smart chargepoint. The remaining 11% of responses from existing BEV drivers indicated that they would only use a residential on-street smart chargepoint if a conventional chargepoint was not available. Most of these drivers are mostly charging at home using a dedicated chargepoint.

Of those responses from participants who do not currently drive a battery electric vehicle but are considering the switch, 52% stated that they would be very likely to use a residential on-street smart chargepoint and a further 15% reported that they would be likely to use one but would use a conventional chargepoint if available. 30% of respondents who are considering the purchase or lease of a BEV indicated that they would be unlikely to use a residential on-street smart chargepoint and the remainder would use one if a conventional chargepoint was not available.

5.6 Workplace

Respondents were receptive to this scenario with 44% of existing BEV drivers indicating that they would be very likely to use a smart chargepoint at their place of work. A further 20% of responses from existing drivers of battery electric vehicles indicated that they would be likely to use a smart chargepoint at their workplace but would use a conventional chargepoint if available. Most of these drivers are using their BEVs more than five times a week and are currently doing most of their charging at home using a dedicated chargepoint.

27% of responses from existing drivers of battery electric vehicles reported that they would be unlikely to use a smart chargepoint at their place of work. Most of these respondents have been driving an electric vehicle for more than 2 years and have a dedicated chargepoint at home.

The remaining 9% of responses from existing BEV drivers indicated that they would only use a smart chargepoint at their place of work if a conventional chargepoint was not available. Most of these respondents have been driving a BEV for 12 months or less.



Of those responses from participants who do not currently drive a battery electric vehicle but are considering the switch, 62% stated that they would be very likely to use a smart chargepoint at their place of work and a further 19% would be likely to use one but would use a conventional chargepoint if available. 19% of respondents who are considering the purchase or lease of a BEV indicated that they would be unlikely to use a smart chargepoint their workplace.

6 Information Displayed at the Smart Chargepoint and on Chargepoint Apps

All respondents who currently drive a battery electric vehicle or are considering the switch to a BEV were asked what information they would want to see displayed at a smart public chargepoint and on chargepoint apps such as Zap-Map. For both questions, the options were as follows:

- likely time of charging restriction;
- nature of charging restriction (e.g., from 22kW to 11kW);
- guaranteed minimum power output;
- messaging showing that a constraint is in force; and
- simple explanation of why constraint is needed.

Respondents were asked to select all options that apply. In addition, there was a free text option for respondents to provide other information that they would like to see displayed at a public smart public chargepoint and / or on smart charging apps.

6.1 Information Displayed at Smart Public Chargepoints

Figure 12 shows the number of responses to each of the options on the information that respondents want to see displayed at smart public chargepoints broken down by existing drivers of battery electric vehicles and those who are considering the purchase or lease of a BEV.

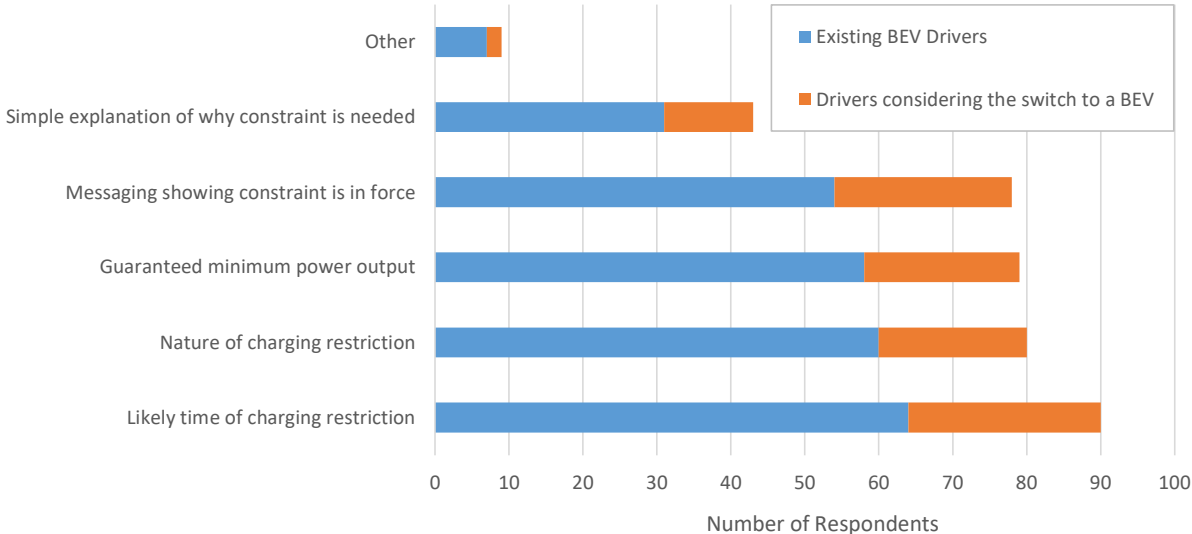


Figure 12 Information that Respondents want to see Displayed at Smart Public Chargepoints



Three quarters of respondents who already drive a battery electric vehicle indicated that they would want to know the likely time of the charging restriction and around 70% would like to know the nature of the charging restriction and the guaranteed minimum power output. More than half of these BEV drivers are over 55 years of age.

64% of responses from existing drivers of battery electric vehicles indicated that they would like messaging showing that a constraint is in force and 36% would like a simple explanation of why a constraint is needed. More than half of these BEV drivers are over 55 years of age

Of those respondents that do not currently drive a battery electric vehicle but are considering the switch, a higher proportion (90%) indicated would want to know the likely time of the charging restriction and 83% would like messaging showing that a constraint is in force. Around 70% of respondents who are considering the purchase or lease of a BEV indicated that they would like to know the nature of the charging restriction and the guaranteed minimum power output. 41% of respondents who are considering the switch to a BEV would like a simple explanation of why a constraint is needed.

Nine respondents stated that they would like to see additional information displayed at a smart public chargepoint:

- Pricing / cost of charging. More than half of existing BEV drivers that suggested additional information wanted to see details related to pricing; however, there was no explicit expectation that the cost of charging would be cheaper when a constraint was in force.
- Impact of the constraint on how much longer it would take to charge a typical battery (e.g. from 50% to full charge).
- Best and worst case scenario for kWh charge forecast by hour.

6.2 Information Displayed on Chargepoint Apps

Figure 13 shows the number of responses to each of the options on the information that respondents want to see displayed on chargepoint apps broken down by existing drivers of battery electric vehicles and those who are considering the purchase or lease of a BEV.

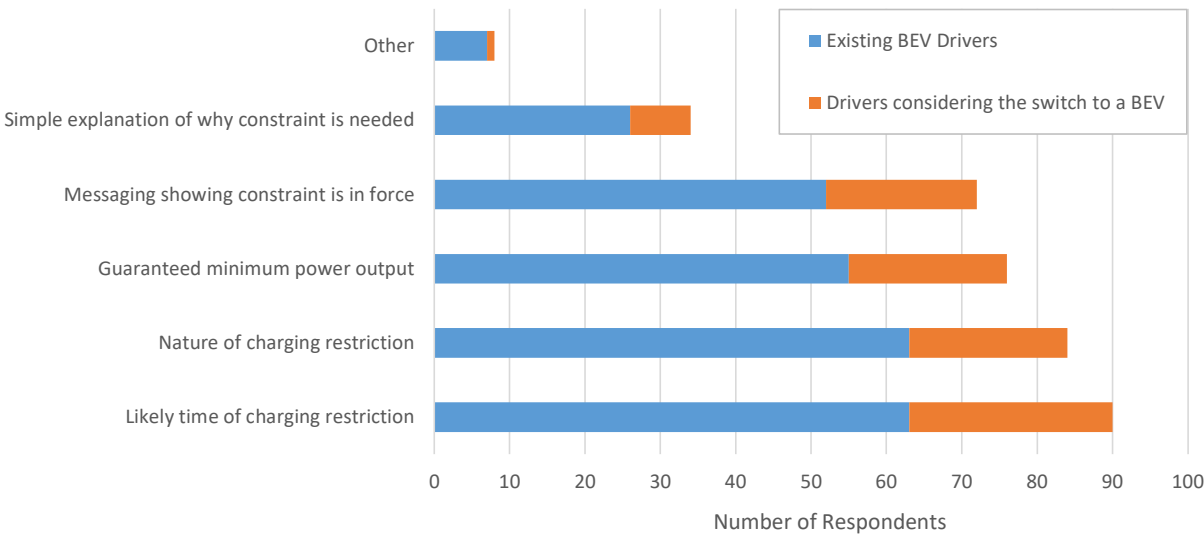


Figure 13 Information that Respondents want to see Displayed on Chargepoint Apps



The findings are broadly similar to the information that respondents want to see displayed at smart public chargepoint. 74% of respondents who already drive a battery electric vehicle indicated that they would want to know the likely time of the charging restriction and the nature of the charging restriction. Two thirds of existing BEV drivers indicated that they would want to know what the guaranteed minimum power output is and 61% want chargepoint apps to indicate that a constraint is in force. 31% of existing BEV drivers would like a simple explanation of why a constraint is needed.

Of those respondents that do not currently drive a battery electric vehicle but are considering the switch, a higher proportion (93%) indicated that they would want to know the likely time of the charging restriction and 72% would like to know the nature of the charging restriction and want the chargepoint apps to show the guaranteed minimum power output. 69% of respondents who are considering the purchase or lease of a BEV indicated that they would like chargepoint apps to indicate that a constraint is in force and 31% would like a simple explanation of why a constraint is needed.

Eight respondents stated that they would like to see additional information displayed on chargepoint apps. These were similar to the 'other' information requirements that respondents want to see at smart public chargepoints and mostly relate to the pricing / cost of charging. In addition, one respondent suggested that alternatives to non-customer friendly wording such as 'restriction', 'constraint' and 'curtailment' were needed to help engage with EV drivers.

6.3 Updates if Curtailment Occurs whilst Charging

All respondents who currently drive a battery electric vehicle or are considering the switch to a BEV were asked how they would like to be informed if a curtailment (reduction in charging rate) occurred whilst they were charging their vehicle as a smart chargepoint. The following options were provided:

- text me when curtailment starts;
- not bothered / don't inform me when curtailment starts;
- text me when curtailment ends (full power has been reinstated);
- not bothered / don't inform me when curtailment ends (full power has been reinstated);
- tell me my charge will take x minutes longer than it would have otherwise; and
- tell me when I return to my EV that curtailment has occurred.

Respondents were asked to select all options that apply. In addition, a free text option was provided for respondents to indicate other information that they would like to know.

Figure 14 shows the number of responses to each of the options on how respondents would like to be informed if a curtailment occurred whilst they were charging their vehicle.

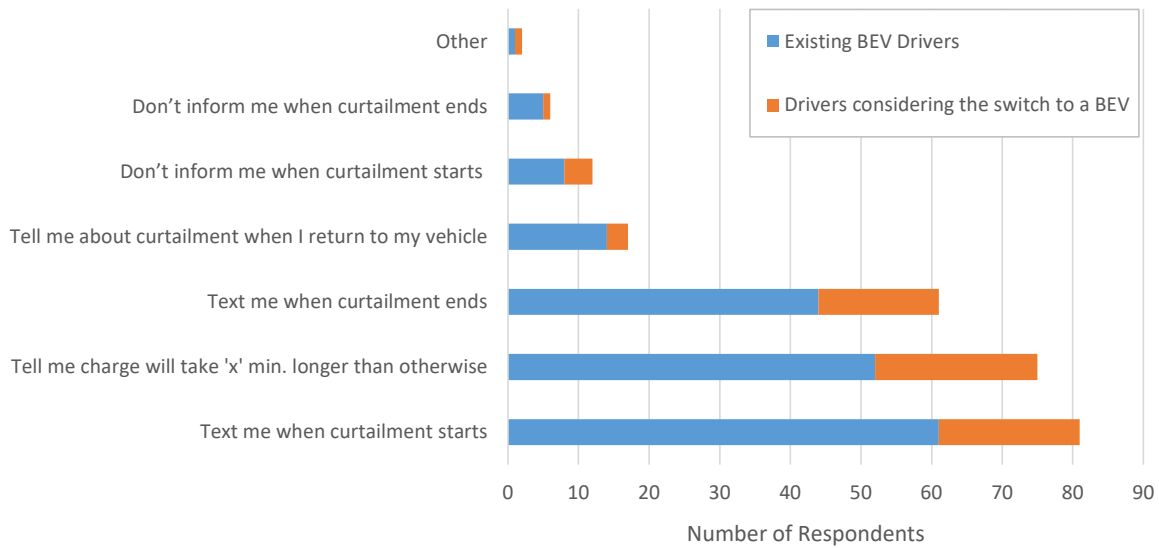


Figure 14 What Respondents want to know if Curtailment Occurs whilst Vehicle is Charging

72% of existing BEV drivers would like to receive a text if curtailment occurred whilst their vehicle is charging and 52% would like to receive a text when curtailment ends. 61% of drivers who already drive a battery electric vehicle would like to be informed how much longer charging will take. Fewer than 10% of existing BEV drivers indicated that they do not want to be informed if a curtailment starts or ends whilst their vehicle was charging and 16% stated that they wanted to be told about curtailment when they returned to their vehicle.

A higher proportion of respondents who are considering the purchase or lease of a BEV (79%) would like to be informed how much longer charging will take. 69% would like to receive a text if curtailment occurred whilst their vehicle is charging and 59% would like to receive a text when curtailment ends. 14% respondents that do not currently drive a battery electric vehicle but are considering the switch indicated that they do not want to be informed if a curtailment starts whilst their vehicle was charging and 10% stated that they wanted to be told about curtailment when they returned to their vehicle.

Only two respondents indicated that they wanted to know additional information if a curtailment occurred whilst charging their vehicle. Both related to the ability to check on charging progress and the state-of-charge kWh.

7 Advantages and Disadvantages of Introducing Smart Public Chargepoints

Respondents were asked about their general satisfaction with the existing number of public chargepoints. In addition, they were asked to provide views on the advantages and / or disadvantages of introducing smart chargepoints in public locations.



7.1 Overall Satisfaction with Number of Existing Public Chargepoints

All respondents who currently drive a battery electric vehicle or are considering the switch to a BEV were asked to rate their satisfaction with the existing number of public chargepoints. The responses are shown in Figure 15.

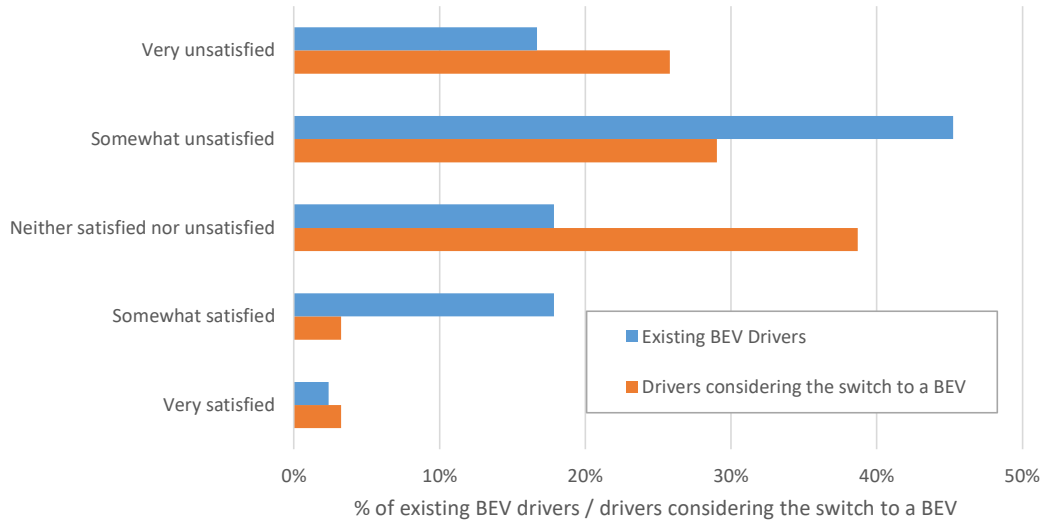


Figure 15 Satisfaction with the Existing Number of Public Chargepoints

62% of respondents who currently drive a battery electric vehicle indicated that they are somewhat unsatisfied or very unsatisfied with the number of public chargepoints. Only 2% of existing BEV drivers reported that they are very satisfied with the number of public chargepoints and a further 18% are somewhat satisfied; 82% of these drivers live in urban or suburban locations. The remaining 18% of BEV drivers had a neutral standpoint being neither satisfied nor unsatisfied with the number of public chargepoints.

The largest proportion of respondents who are considering the purchase or lease of a BEV (39%) reported being neither satisfied nor unsatisfied. 29% indicated that they are somewhat unsatisfied and a further 26% are very unsatisfied. The remaining 6% reported that they are very satisfied or somewhat satisfied with the number of public chargepoints.

7.2 Respondents Views on the Introduction of Smart Public Chargepoints

Respondents were asked to share their views on the advantages and / or disadvantages of introducing smart chargepoints in public locations. Where respondents have reservations, they were asked what would make the introduction of smart public chargepoints more acceptable to them.

59 participants provided feedback of some form. The comments varied in quality and usefulness but could broadly be categorised as:

- *Positive* to the introduction of smart public chargepoints.
- *Negative* to the introduction of smart chargepoints in public locations.
- *Neutral*. Respondents did not provide a view on the introduction of smart public chargepoints but commented on issues concerning public chargepoints in general.

The responses are summarised in Sections 7.2.1 to 7.2.3.



7.2.1 Positive Feedback

29 of the respondents who provided feedback were generally positive about the introduction of smart chargepoints in public locations; this corresponds to just over 27% of participants who are existing drivers of battery electric vehicles and 19% of those who are considering the purchase or lease of a BEV.

Some examples of the feedback received are provided in Table 1.

Table 1 Positive Feedback on the Introduction of Smart Chargepoints in Public Locations

<p><i>“The main advantage is that more people can get some charge at once, so fewer people have to wait.”</i></p>
<p><i>“If it means more sockets installed it’s a good thing.”</i></p>
<p><i>“If it means there will be more chargers available, albeit at a lower rate of charge, then it would be a good thing.”</i></p>
<p><i>“A great option, even in the long term. Allows everyone to plug in minimising queuing and realistically reduced speeds are likely to have minimal impact. “</i></p>
<p><i>“Sensible to allow charging of more vehicles when no constraints are in place. Fine to have constraints as long as users are made aware (preferably in advance).”</i></p>
<p><i>“I think it’s a good idea. It means more chargers can be installed and I’m less likely to not be able to access a charge point. That’s the biggest disappointment in long stay locations - not enough chargers, not so much level or consistency of power output.”</i></p>
<p><i>“Any efficient, properly maintained additions to the existing charging network would be welcomed.”</i></p>
<p><i>“For me it would be better to have a number of smart chargers than one standard charger.”</i></p>
<p><i>“Sounds like a great idea to introduce the physical infrastructure even if the underlying supply capacity is not yet ready. EV drivers need charge points now, not later, even if the charging is a bit slower.”</i></p>
<p><i>“Faster installation of public charging infrastructure can only be a good thing. Most drivers don’t need full charge and are not needing rapid charging as they would leave them for several hours anyway.”</i></p>
<p><i>“The greater the flexibility the better. Full charge isn’t essential at all times.”</i></p>
<p><i>“I think this is an excellent idea. The most stressful aspect of EV ownership is not being able to find a charge point on a long journey. Having to spend longer charging is not a problem, compared to driving on and on again to find somewhere to simply plug in and start.”</i></p>
<p><i>“Seeing more charging points around will increase the likelihood of people transitioning to EVs. One of the biggest blockers is the perception of insufficient access to charging infrastructure, so the more charging points that are ‘seen’, the more people will be willing to consider an EV.”</i></p>



Some of the positive feedback included additional comments about what else needs to be in place to make smart public chargepoints fully acceptable. These mainly relate to pricing and the need for incentives to use such chargepoints otherwise there is no perceived benefit to the end user. In addition, there is a need for clear and user-friendly signage and communication to inform and reassure users of smart public chargepoints.

7.2.2 Negative Feedback

Only three respondents were completely averse to the introduction of smart chargepoints in public locations. These are all existing drivers of battery electric vehicles who indicated that they are satisfied with the current number of public chargepoints. The comments can be summarised as follows:

- Smart public chargepoints will cause chaos and confusion and risk slowing mass adoption of electric vehicles.
- People will not accept having their charge restricted under any circumstances; public charging needs to be available to those who need it when they need it.
- Curtailment of chargers at en route locations is totally unacceptable as the objective is to charge quickly and continue with the onward journey.

7.2.3 General Comments on Public Chargepoints

25 respondents provided feedback on public chargepoints in general rather than specifically about the introduction of smart chargepoints in public locations. There are a number of common themes running through the comments as follows:

- There are not enough public chargepoints and there is a need for more low rate chargers in long term / overnight carparks.
- Reliability of existing public chargepoints. Respondents reported their frustrations with chargepoints being out of order and stressed the need for chargepoints to be properly maintained, as well as the need for accurate reporting of chargepoint status.
- Location of public chargepoints. They need to be sited in well-used and well-lit locations such that users feel safe, particularly at night. Consideration also needs to be given to disabled drivers; for example, on-street chargepoints located on pavements with kerbs cause difficulties for wheelchair users.
- Access to chargepoints. There is frustration amongst existing drivers of battery electric vehicles that public chargepoints are often blocked by petrol or diesel vehicles. Respondents commented that there should be penalties, which need to be enforced, for blocking a chargepoint.
- Queuing at chargepoints. Existing drivers of battery electric vehicles commented that there is a lack of queuing facilities at chargepoints which makes it difficult for drivers to leave their vehicle whilst waiting for a chargepoint to become free.



8 Key Findings

A survey of end users has been carried out to obtain feedback on EV driver attitudes towards the acceptability of smart chargepoints in public locations. This report describes the approach adopted and compiles the responses from existing drivers of battery electric vehicles and those who are considering the switch to a BEV.

Participants were asked about the likelihood of using a smart public chargepoint in different locations, what information they would like to see displayed at the chargepoint / on chargepoint apps and how they would like to be informed that the charging rate had changed whilst charging their vehicle. They were also asked to provide their views on the potential advantages and / or disadvantages of introducing smart chargepoints in public locations and, if they have reservations, what could be done to make smart chargepoints more acceptable to them as a charging option.

The survey also included a short section on demographics to determine whether views on smart public chargepoints differ by gender, age and / or geographic location. The main difference was the age profile of participants that do not currently drive a battery electric vehicle but are considering the switch, where 52% of respondents were under 45 years of age, compared with only 26% of existing BEV drivers. The breakdown of responses on the likelihood of using smart public chargepoints in different locations, information / messaging requirements and advantages and disadvantages of smart public chargepoints did not differ significantly by gender, age or geographic location.

8.1 Acceptability of Smart Public Chargepoints in Different Locations

Participants were asked how likely they would be to use a smart chargepoint in several different situations: short term destination, medium term destination, overnight destination, en route location, residential on-street and workplace. The findings can be summarised as follows (see Section 5 for further details):

- Respondents were most receptive to using a smart public chargepoint at an overnight destination such as a hotel. 66% of existing BEV drivers and 81% of those who are considering the purchase or lease of a BEV indicated that they would be very likely to use a smart chargepoint at an overnight destination.
- Respondents were also receptive to smart chargepoints at their place of work with 44% of existing BEV drivers stating that they would be highly likely to use one. A higher proportion (62%) of participants who are considering the switch to a BEV indicated that they would be very likely to use a smart chargepoint at their place of work.
- Respondents were reasonably receptive to smart chargepoints at medium-term destinations such as a tourist or leisure facilities. 32% of existing BEV drivers and 38% of those who are considering the purchase or lease of a BEV stated that they would be very likely to use a smart chargepoint at a medium-term destination.
- 66% of existing BEV drivers with no access to a chargepoint at home indicated that they would be highly likely to use a residential on-street smart chargepoint. This compares with 28% of all existing BEV drivers indicating that they would be very likely to use a residential on-street smart chargepoint. Participants who do not currently drive a battery electric vehicle but are considering the switch were receptive to this scenario with 52% stating that they would be very likely to use a residential on-street smart chargepoint.
- The least acceptable location for smart chargepoints was at en route locations such as motorway service stations. Only 19% of existing BEV drivers and 21% of those considering



the purchase or lease of a BEV indicated that they would be very likely to use a smart chargepoint at an en route location.

- Existing drivers of battery electric vehicles were not very receptive to using a smart public chargepoint at a short term destination such as a supermarket with only 20% reporting that they would be highly likely to use one. This is perhaps not unexpected given that the majority of existing BEV drivers have a dedicated chargepoint for their vehicle at home.

In summary, respondents were most receptive to using smart public chargepoints where their vehicle would be parked for more than four hours; for example, at the workplace and overnight destinations. Smart chargepoints at en route locations were regarded least favourably by all respondents, presumably because drivers want to charge their vehicle and continue their journey in the shortest possible time.

8.2 Information / Messaging at Smart Chargepoint

Participants were asked what information they would like to see displayed at a smart public chargepoint. The findings can be summarised as follows:

- The most important information that respondents would like to see displayed is the likely time of the charging restriction (75% of existing BEV drivers and 90% of those considering the purchase or lease of a battery electric vehicle).
- Other information that respondents would like to see displayed at a smart public chargepoint is the nature of the charging restriction, the guaranteed minimum power output and messaging showing that a constraint is in force.
- 36% of existing BEV drivers indicated that they would like to see a simple explanation of why a constraint is needed displayed at the chargepoint. This compares with 71% of those participants who are considering the switch to a battery electric vehicle.
- A higher proportion of participants who are considering the purchase or lease of a battery electric vehicle would like to see information / messaging at a smart chargepoint than existing BEV drivers.

Additional information that respondents would like to see displayed at a smart public chargepoint mainly related to details about pricing. However, there was no explicit expectation that the cost of charging would be cheaper when a constraint was in force.

8.3 Information / Messaging on Chargepoint Apps

The findings on the information that participants would like to see displayed on chargepoint apps are broadly similar to the information that respondents want to see displayed at smart public chargepoints. Again, a higher proportion of participants who are considering the switch to a BEV would like to see information on chargepoint apps than existing drivers of battery electric vehicles.

The 'other' information that respondents would like to see displayed on chargepoint apps mainly relate to the price of charging at smart public chargepoints. It was also suggested that alternatives to non-customer friendly wording such as 'restriction', 'constraint' and 'curtailment' were needed to help engage with EV drivers.



8.4 Information / Messaging if Curtailment Occurs Whilst Vehicle is Charging

Participants were provided with a number of options of how they would like to be informed if a curtailment occurred whilst they were charging their vehicle at a smart chargepoint. The responses are summarised below:

- 72% of existing BEV drivers would like to receive a text when curtailment starts but fewer (52%) would like to receive a text when full power is reinstated.
- Participants who are considering the purchase or lease of a battery electric vehicle are most interested in being told how much longer charging will take if a curtailment occurs whilst they are charging their vehicle.
- A small proportion of participants (16% of existing BEV drivers and 10% of those considering the switch) indicated that they would want to be informed about curtailment when they returned to their vehicle.

8.5 Satisfaction with Existing Number of Public Chargepoints

In terms of satisfaction with the existing number of chargepoints in public locations, 62% of respondents who currently drive a battery electric vehicle indicated that they are somewhat unsatisfied or very unsatisfied. 20% of existing BEV drivers stated that they are very satisfied or somewhat satisfied with the number of public chargepoint; 82% of these drivers live in urban or suburban areas.

The largest proportion of respondents who are considering the purchase or lease of a BEV (39%) reported being neither satisfied nor unsatisfied. This is probably to be expected as these participants may have little experience of needing to use a public chargepoint.

8.6 Participant Feedback on the Introduction of Smart Public Chargepoints

52% of all survey participants provided feedback of some form. The comments varied in quality and usefulness but could broadly be categorised as positive towards the introduction of smart chargepoints, negative towards the introduction of smart chargepoints or 'neutral', where the feedback related to issues with public chargepoints in general rather than smart public chargepoints.

Just under half of the comments provided were positive with respondents welcoming the prospect of more public chargepoints being installed, even if charging rates may be reduced at certain times. Some of the respondents who were positive about the introduction of smart chargepoints in public locations also commented about pricing and the need to provide incentives for EV drivers to use them. In addition, respondents stated that there is a need for clear and user-friendly signage and communication to inform and reassure potential users of smart public chargepoints.

Only three respondents were completely averse to the introduction of smart chargepoints in public locations. These participants commented that smart public chargepoints will cause chaos, and drivers will not accept having their charge restricted under any circumstances, particularly at en route locations where the objective is to charge quickly and continue with the onward journey.

There were a number of common themes running through the general comments on public chargepoints. These included the need for more chargepoints in public locations, improved reliability and accurate reporting of chargepoint status. In addition, respondents commented that public chargepoints need to be sited considering the needs of disabled drivers and in well-used and well-lit locations such that users feel safe.



Appendix I – Copy of End-User Survey

Electric Vehicle Drivers' Views on 'Smart' Public Chargepoints

Legislation has been passed prohibiting the sale of new petrol and diesel fuelled cars and vans by 2030 and hybrids by 2035. Approximately 40% of UK homes do not have private off-road parking. This means there needs to be a high availability and accessibility of public chargepoints before drivers living in these properties switch to electric vehicles and to facilitate EV charging for drivers on longer journeys.

This short survey aims to collect views on the introduction of 'smart charging' connections - these have the potential to increase the number of public chargepoints in the short term without the need for costly upgrades to the electricity network.

We are interested in gathering feedback from drivers of battery electric vehicles (those that have a battery powered electric motor only and MUST be plugged in to charge) - and those drivers considering the switch to a battery electric vehicle.

Section 1: Driving Behaviours

Firstly, some questions about the type of vehicle you drive, access to parking where you live, how often and where you usually charge your vehicle.

- Q1. Do you drive the following:
- (a) Battery electric vehicle (has a battery powered electric motor only and must be plugged in to charge)
 - (b) Plug in hybrid electric vehicle (has both a battery-powered electric motor and a petrol/diesel engine that needs to be refuelled)
 - (c) Neither of the above

If (c) go to Q2, if (a) or (b) go to Q3.

- Q2. This survey is collecting views from existing and potential drivers of battery electric vehicles. Are you planning to purchase or lease a battery electric vehicle?
- (a) Within 6 months
 - (b) Within 6 to 12 months
 - (c) At some point in the future
 - (d) No plans to buy or lease a battery electric vehicle

If (d) end survey, else go to Q3.

- Q3 How long have you driven an electric vehicle?
- (a) Less than 6 months
 - (b) 6 months to 1 year
 - (c) 1 to 2 years
 - (d) 2 to 5 years
 - (e) More than 5 years



- Q4 Is the electric vehicle the primary, secondary or only vehicle in your household?
- (a) Primary
 - (b) Secondary
 - (c) Only vehicle
- Q5 How frequently do you drive your electric vehicle
- (a) Every day
 - (b) 5-6 times per week
 - (c) 3-4 times per week
 - (d) 1-2 times per week
 - (e) Less than once a week
- Q6 How often do you typically make trips that exceed the range of your electric vehicle (i.e. you need to charge en-route to your destination)?
- (a) More than once per week
 - (b) Once per week
 - (c) Several times per month
 - (d) Once per month
 - (e) Several times per year
 - (f) Once per year
 - (g) Less than once a year
 - (h) Never
- Q7 Which of the following best describes your ability to charge your EV at your normal home address?
- (a) I have a dedicated chargepoint for my vehicle
 - (b) I do not have a dedicated EV chargepoint at home but am able to charge my vehicle by running an extension cable from my house/garage
 - (c) I have access to a communal chargepoint (e.g. in the private car park at an apartment block)
 - (d) I have no access to a chargepoint at home and charge my vehicle elsewhere (e.g. workplace and/or public chargepoints)
 - (e) Other (please specify)

If (d) go to Q9 else go to Q8.

- Q8 Which of the following best describes how you normally charge your vehicle?
- (a) I do almost all of my charging at my home
 - (b) I mostly charge at home, but sometimes use public chargepoints
 - (c) I use an even split of home charging and public charging
 - (d) I do most of my charging at work
 - (e) I mostly charge at work, but also charge at home
 - (f) I mostly charge at work, but sometimes use public chargepoints
 - (g) I use an even split of workplace charging and public charging
 - (h) I do all of my charging using public chargepoints
 - (i) None of the above (please specify)

Go to Q10.



- Q9 Which of the following best describes your ability to charge your EV at your normal home address?
- (a) I have a dedicated chargepoint for my vehicle
 - (b) I do not have a dedicated EV chargepoint at home but am able to charge my vehicle by running an extension cable from my house/garage
 - (c) I have access to a communal chargepoint (e.g. in the private car park at an apartment block)
 - (d) I have no access to a chargepoint at home and charge my vehicle elsewhere (e.g. workplace and/or public chargepoints)
 - (e) Other (please specify)
- Q10 Which of the following best describes how you normally charge your vehicle?
- (a) I do most of my charging at work
 - (b) I mostly charge at work, but sometimes use public chargepoints
 - (c) I use an even split of workplace charging and public charging
 - (d) I do all of my charging using public chargepoints
 - (e) None of the above (please specify)

Section 2 – Views on ‘Smart’ Public Chargepoints

Studies suggest that around 400,000 public chargepoints are required by 2030 – nearly an eightfold increase from the present number. However, this could pose a challenge to the electricity infrastructure in terms of accommodating the anticipated electric vehicle (EV) charging load in a cost-effective and timely way.

Flexible connections (also known as ‘smart charging’ connections) have the potential to increase the number of public chargepoints by occasionally managing the load connected to the electricity network. The likely impact on the user of a ‘smart’ chargepoint is that the vehicle will take longer to reach full charge if a constraint, namely, a reduction in the charging rate, is in force.

Q11 How likely are you to use a smart chargepoint at the following locations?

Location	Highly likely	Likely – but would use conventional chargepoint if available	Unlikely	Only if conventional chargepoint not available
Short-term destination (0–2 hours), e.g., shopping excursion (city centre carpark, supermarket, out-of-town retail park)				
Medium-term destination (2–4 hours), e.g., leisure/tourist attraction				
Overnight destination (e.g., hotel)				
En route location (e.g., motorway service station)				
Residential on-street				
Workplace				



- Q12 What information would you want to see displayed at the smart chargepoint?
(Please tick all that apply.)
- (a) Likely time of charging restriction
 - (b) Nature of charging restriction (e.g., from 22kW to 11kW)
 - (c) Guaranteed minimum power output
 - (d) Messaging showing that a constraint is in force
 - (e) Simple explanation of why constraint is needed
 - (f) Other (please specify)
- Q13 What information would you want to see displayed on chargepoint apps such as Zap Map?
(Please tick all that apply.)
- (a) Likely time of charging restriction
 - (b) Nature of charging restriction (e.g., from 22kW to 11kW)
 - (c) Guaranteed minimum power output
 - (d) Messaging showing that a constraint is in force
 - (e) Simple explanation of why constraint is needed
 - (f) Other (please specify)
- Q14 If you were charging your vehicle at a smart chargepoint and a curtailment (reduction in charging rate) occurred, which of the following statements would apply? (Please tick all that apply.)
- (a) Text me when curtailment starts
 - (b) Not bothered/Don't inform me when curtailment starts
 - (c) Text me when curtailment ends (full power has been reinstated)
 - (d) Not bothered/Don't inform me when curtailment ends (full power has been reinstated)
 - (e) Tell me my charge will take x minutes longer than it would have otherwise
 - (f) Tell me when I return to my EV that curtailment has occurred
 - (g) Other information (please specify)
- Q15 How satisfied are you with the existing number of public chargepoints?
- (a) Very satisfied
 - (b) Somewhat satisfied
 - (c) Neither satisfied nor unsatisfied
 - (d) Somewhat unsatisfied
 - (e) Very unsatisfied
- Q16 Please provide any views you have on the advantages and/or disadvantages of introducing smart chargepoints in public locations. If you have reservations, what would make smart chargepoints more acceptable to you as a charging option in public locations?



Section 3: Demographics

Finally, a few more questions about you so that we can determine whether views on public chargepoints differ by gender, age and / or geographic location. If you do not wish to answer any of the questions, please select "Prefer not to say".

Q17 With which gender do you identify?

- (a) Female
- (b) Male
- (c) Other
- (d) Prefer not to say

Q18 What is your age?

- (a) Under 25
- (b) 25 - 34
- (c) 35 - 44
- (d) 45 - 54
- (e) 55 - 64
- (f) 65 +
- (g) Prefer not to say

Q19 In which country do you normally reside?

- (a) England
- (b) Northern Ireland
- (c) Scotland
- (d) Wales
- (e) Other
- (f) Prefer not to say

Q20 How would you describe the area you live in?

- (g) Urban
- (h) Rural
- (i) Suburban
- (j) Prefer not to say

Thank you for taking the time to complete this survey and share your views on smart public chargepoints